“Studies on Eco-Friendly Approaches for the Integrated Management of Fungal Diseases of Onion (*Allium cepa* L.)"

SYNOPSIS

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1. INTRODUCTION

The Onion (*Allium cepa* L.) a bulbous, biennial herb belongs to family Amaryllidaceae is an important crop of India with a constant demand. It is used as a vegetable and most widely cultivated species of the genus *Allium*. The primary center of origin lies in central Asia. The near East and Mediterranean are the secondary centers of origin and introduced in India from Palestine. In India it is cultivated in Maharashtra, Karnataka, Gujarat, Bihar, Madhya Pradesh,Andhra Pradesh, Rajasthan and Haryana (Anon.,2011). Losses of onion during storage are considerable mainly due to sprouting and contamination by several microorganisms. Nearly 40% of the production is lost during post harvest handling and sprouting, of which microbial spoilage alone contributes approximately 15-20% of the total loss (Pantastico and Bantista, 1976;). The post-harvest diseases of onion, black mould rot caused by *Aspergillus niger* was the predominant one. As a foodstuff they are usually served cooked, as a vegetable or part of a prepared spicy dish, but can also be eaten raw or used to make pickles or chutneys. They are pungent when chopped and contain certain chemical substances which irritate the eyes. Onions contain phenolics and flavonoids that have potential anti-inflammatory, anti-cholesterol, anticancer and antioxidant properties. Onions produce various sulfur-containing compounds (such as cysteine sulfoxide), probably for defense against fungi and insects, that, together with their breakdown products, produce their distinctive odor, flavor, and lachrymatory (tear-stimulating) properties.

The objective of the present study will be find out the most efficient fungicide(s), phyto-extract(s) and bio-control agent(s), used either alone or in combination for the management of the onion disease.

2. REVIEW OF LITERATURE AND DEVELOPMENT IN THE SUBJECT

Studies will be discussed with earlier findings made in India and abroad. The results would be of a great significance and useful in the management of important &

severe diseases of onion. Srinivasan and Shanmugam (2006) was concluded that windrow method of curing and hanging method of storage effectively contained *Aspergillus niger* rot of onion & carbendazim was observed to be the most effective fungicide when applied either as foliar spray in the standing crop or as post-harvest. From India, Rajam (1992) reported that among the post-harvest diseases of onion, black mould rot caused by *Aspergillus niger* was the predominant one. *Aspergillus niger*, a soil saprophyte being ubiquitous in occurrence attacks onion by producing various enzymes and toxins and establishes itself in bulb and other tissues. Therefore, no effective management practices (Chavan et al., 1992). Maude et al. (1984) also reported that neck rot disease was substantially reduced if topped onion were dried at 30° C. Many workers have reported the use of plant extract for controlling the growth of disease causing pathogens of onion (Pushpker and Saler, 2010; Rana, et al., 2007). *Lawsonia alba, Parthenium hysterophorus & Moringa oleifera* plant extract were beneficial and showed result in inhibiting growth of onion pathogens (Gaikwad, et al.,2014).

3. OBJECTIVES OF RESEARCH /PROPOSED HYPOTHESIS:

The present work includes following objectives-

1. Survey of onion fungal diseases.
2. Physico-chemical parameters of rhizospheric soil & infected onion.
3. Population Dynamics of mycoflora in infected rhizospheric soil of onion.
4. Isolation, Identification and pathogencity of the pathogens.
5. Sensitivity of pathogens to different fungicides (MIC).
6. Study of enzymes and toxins of the pathogens.
7. Biopesticidal management strategy of the pathogens.

HYPOTHESIS

Experiment on yield losses will be a positive correlation between disease rating and percentage loss in the onion bulb i.e. percent loss in dry weight increased in direct proportion to the increase in disease rating. The correct symptomatology, identification and morphological characters of pathogens would be observed and recorded. Pathogencity would be confirmed and given satisfactory results. Population

dynamics of mycoflora would also be essential to reduce the diseases incidence. Appropriate fungicides and proper concentration would be minimize the disease incidence. Status of enzymes and toxins would be expected from isolated pathogens. Eco-friendly approaches like plant extracts and biocontrol agents will show very promising results and minimize severe losses of onion productivity. Integrated Fungal Disease Management Programme emphasis the use of eco-friendly cost effective and easily available components like plant extracts for control of fungal disease and reduce the use of chemical fungicides.

4. METHODOLOGY

1. Survey of fungal diseases of Onion from study sites.
2. Physico-chemical parameters of rhizospheric soil will be determined according to (AOAC,1994) & estimation of different biochemical characteristics from infected o nion by different methods (Lowry's et.al., 1951; Mungikar, 1999; Sadashivam and Manikam, 2002).
3. Population Dynamics of mycoflora in infected rhizospheric soil of onion (Cooney and Emerson 1964,; Waksman et al., 1939).
4. Isolation, Identification and pathogencity of the pathogens according to (Barnett and Hunter, 1980; Subramanian, 1971; Mukadam, 1997).
5. Sensitivity of pathogen to different fungicides (MIC) (Schmitz, 1932; Dekkar and Gielink, 1979. Nene and Thapliyal, 2002).
6. Study of enzymes and toxins of the pathogen. (Dingale et al., 1953).
7. Biopesticidal management strategy of the pathogens. (Mishra and Tiwari, 1992).

5. IMPORTANCE OF STUDY/ SOCIETY APPLICATION

Onion suffers from pest, bacterial and fungal diseases, but the fungicides cause pollution and disturb microbial balance of the soil. Under integrated fungal disease management programme cost effective and eco- friendly component like plant extracts, products, biopesticides etc used to control plant pathogens. Experimentations over the years have established that botanicals are socially acceptable by the farmers, environment friendly and economically feasible for managing the diseases and pests

in crops. Many cultivars have been developed for size, form, color, storability, resistance to pests and pathogens and climatic adaptations.

International status

Biopsticides have been used to protect plant against diseases attacked by pathogenic organisms. A number of pathogens have been found responsible for the disease, of which *Alternaria porri, A. alternata and Stemphylium vesicarium* are the most common (Gupta, Srivastava, Pandey, & Midmore, 1994; Boff, 1996; Cova & Rodriguez, 2003). Jeyalakshmi and Seetharaman (1998) have reported the efficacy of *T. harzianum* and *B. subtilis* for the control of *Colletotrichum capsici*. However, there were no prior comparative studies of fungicides and bio-control agents for the control of foliar blight of onion. Onion suffers from many diseases from pre harvest to post harvest period. They survey conducted at the international level revealed that about 35-40 % onion is lost due to damage caused by different diseases, Gupta and Verma (2002). Vigitha et al. (2014) reported to manage the fungal diseases in red onion effectively by using plant doctor fungi *Trichoderma* sp without dangerous fungicides. Turkusay and Onogur (1998) reported that spore germination of *A. porri* was inhibited by *Hedera helix* Low concentration of extracts followed by *Datura stramonium* L. extracts. *Ficus carica* L. and *Avena sativa* L. extract also affected colony development. Kumar et al. (2012) tested different plant extracts on solid and liquid media against *Alternaria* spp. and reported that *A. sativum* L. was found to be most effective.

National Status

India is an agricultural country. Pesticides, extensively to protect crop plants from different pathogens. Indian farmers are applying different pesticides, biopesticides for the management of plant diseases. Govt. of India had approved 125 pesticides for under pesticidal Act. However, in recent year's application of pesticides have raised several problems among which development of pathogenic organisms. In India, currently about 35-40 %of the onion is estimated to be lost as postharvest losses during various postharvest operations including handling and storage, (Panday, 1985).

The efficacy of mancozeb in the control of foliar blight of onion has also been reported by Gupta Srvastava and Shrma (1996). Rahman et al. (1988) evaluated different fungicides against the purple blotch of onion, among them mancozeb was reported as the best fungicide for the management of the disease.

Significance of the study

Onion is good source of minerals, vitamins, Polyphenol and a number of phytonutrients. It lower blood pressures, heart diseases and prevents some kinds of cancer (Augusti, 1990). But, the major restriction that limit production due to damping-off (*Fusarium oxysporum f.sp.cepae; Pythium* sp.*; Sclerotium rolfsii* and *S. cepivorum* and *Colletotrichum* sp.), purple Blotch (*Alternaria porri*), stemphylium Blight (*Stemphylium vesicarium*), basal Rot (*Fusarium oxysporum f.sp. cepae*), downy Mildew (*Perenospora destructor*), Onion smut (*Urocystis cepulae*), black mould (*Aspergillus niger*), bacterial brown rot (*Pseudomonas aeruginosa*), white rot (*Sclerotium rolfsii*), neck rot (*Botrytis allii*) and Onion smudge (*Colletotrichum circinans*). Among them, black mould (*Aspergillus niger*), damping-off (*Pythium* sp), white rot (*Sclerotium rolfsii*) and neck rot (*Botrytis allii*) were found severe & common in study site. Therefore there is a need to manage these diseases by Integrated Fungal Disease Management Programme (IFDMP), highlighting the use of environmental cost effective strategy

6. PROPOSED WORK PLAN/ FORMULATION AND STRUCTURE OF STUDY

Year-wise Plan of work and targets to be achieved

First Year:

1) Literature survey of proposed work plan.
2) Field visits to onion cultivation sites for collection of infected specimens.
3) Survey of onion fungal diseases.
4) Physico-chemical parameters of rhizospheric soil & infected onion.

Second Year:

1) Population Dynamics of mycoflora in rhizospheric soil & infected onion.
2) Isolation, Identification and pathogencity of the pathogens.

3) Sensitivity of pathogens to different fungicides (MIC).

Third Year:

1) Studies on enzymes and toxins from the pathogens of Onion diseases.

2) Biopesticidal management strategy of the onion pathogens.

3) Thesis writing.

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